You can determine the equation of a line given **the slope and ANY point** that lies on that line.

Given the slope (m) and a point (x, y):

1. Plug the slope (m) and the coordinates of the point (x, y) into $y = mx + b$.

2. Solve for the y-intercept (b).

3. Write your equation in $y = mx + b$ form with your slope (m) and y-intercept (b) plugged in.

Example

Determine the equation of the line with slope -2 through the point (3, -7)

m

x y

$$y = mx + b \qquad \boxed{substitute}$$

① $(-7) = (-2)(3) + b$ multiply

② $-7 = -6 + b$

$+6 \qquad +6$ opposite operations

*make sure you do the same thing on both sides "

$$\boxed{-1 = b}$$

③ $\therefore y = -2x - 1$

m b

Determine the equation of the lines with the given slopes through the given point.

Slope = 3, Point = (4, 5) $y = mx + b$ $5 = (3)(4) + b$ $5 = 12 + b$ $-12 \quad -12$ $-7 = b$ $\therefore \quad y = 3x - 7$ $\qquad m \qquad b$	Slope = -5, Point = (2, -1) $y = mx + b$ $-1 = (-5)(2) + b$ $-1 = -10 + b$ $+10 \quad +10$ $9 = b$ $\therefore \quad y = -5x + 9$ $\qquad m \qquad b$
Slope = -1, Point = (-4, -2) $y = mx + b$ $-2 = (-1)(-4) + b$ $-2 = 4 + b$ $-4 \quad -4$ $-6 = b$ $\therefore \quad y = -x - 6$ $\qquad\quad m \qquad b$	Slope = 6, Point = (0, -3) $y = mx + b$ $(-3) = (6)(0) + b$ $-3 = 0 + b$ $-3 = b$ $\therefore \quad y = 6x - 3$ $\qquad\quad m \qquad b$
Slope = $\frac{1}{2}$, Point = (-6, 7) $y = mx + b$ $7 = (\tfrac{1}{2})(-6) + b$ $7 = -3 + b$ $+3 \quad +3$ $10 = b \quad \therefore \quad y = \frac{1}{2}x + 10$ $\qquad\qquad\qquad\qquad m \qquad b$	Slope = $-\frac{3}{4}$, Point = (12, 0) $y = mx + b$ $0 = (-\tfrac{3}{4})(12) + b$ $0 = \dfrac{-36}{4} + b$ $0 = -9 + b \quad \therefore \quad y = \frac{-3}{4}x + 9$ $+9 \quad +9$ $9 = b \qquad\qquad\qquad m \qquad b$